

The following research was conducted in response to a request from the U.S. Department of Transportation's (DOT's) Joint Program Office (JPO) that the National Research Council's (NRC's) Transportation Research Board (TRB) undertake a review of JPO's Intelligent Transportation Systems (ITS) Standards Program. The entire report published by the National Academy Press, Washington, D.C., 2000 is available online at:

http://nationalacademies.org/trb/publications/reports/its_standards_review.pdf

Appendix B: ITS Standards Documents

Title	Lead SDO and Document Number	Description
A Conceptual ITS Architecture: An ATIS Perspective	SAE J1763	A description of a general reference architecture for integration of multiple advanced traveler information system (ATIS) devices. This conceptual architecture provides a general view of ITS functions and interfaces; however, the National ITS Architecture reflects a more current conceptual model in this area.
ATC Application Program Interface (API)	ITE 9603-1	Advanced transportation controller (ATC) software application program interfaces (APIs) that support ITS data flows and standards enabling the deployment of ITS functions. The APIs provide a template for API programming for specific functionality associated with equipment and market packages defined by the National ITS Architecture.
ATC Cabinet	ITE 9603-2	Functional physical design requirements for an ATC cabinet that supports the deployment of multiple ITS functions in a single unit.
Adaptive Cruise Control: Operating Characteristics and User Interface	SAE J2399	Minimum requirements for safety related elements of the operating characteristics and user interface of vehicles equipped with adaptive cruise control (ACC). Also coordinates the operating characteristics and user interface with collision warning and avoidance, along with other driver systems.
Advanced Transportation Controller (ATC)	ITE 9603-3	Standard for ATC devices to support ITS data flows and standards that enable deployment of ITS. Capable of operating in the ATC cabinet and using the ATC APIs.
Advanced Traveler Information System (ATIS) Data Dictionary	SAE J2353	A minimum set of medium independent data elements needed by potential information service providers to deploy ATIS services and provide the basis for future interoperability of ATIS devices.
Advanced Traveler Information System (ATIS) Message Set	SAE J2354	A basic message set using the data elements from the ATIS Data Dictionary needed by potential information service providers to deploy ATIS services and to provide the

		basis for future interoperability of ATIS devices.
Commercial Vehicle Credentials	ANSI TS286	An electronic data interchange (EDI) transaction set that can be used by owners, lessees, and drivers of commercial motor vehicles to apply electronically for credentials necessary to operate those vehicles legally. Can also be used by authorizing jurisdictions to transmit credential data electronically to applicants and other authorized entities.
Commercial Vehicle Safety Reports	ANSI TS285	An EDI transaction set to permit enforcement officials, government administrators, and other authorized parties to retrieve electronically information on the safety performance, regulatory compliance, and credentials status of commercial motor vehicles, carriers, and drivers.
Commercial Vehicle Safety and Credentials Information Exchange	ANSI TS285	An EDI transaction set to permit enforcement officials, government administrators, and other authorized parties to retrieve electronically information on the safety performance, regulatory compliance, and credentials status of commercial motor vehicles, carriers, and drivers.
Data Radio Channel (DARC) System	EIA/CEA EIA-794	Specification of the DARC FM subcarrier waveform for the delivery of traveler information, messages, and data services to mobile, portable and fixed receivers.
Field Test Analysis Information Report	SAE J2372	Results of field tests on location referencing standards.
Forward Collision Warning: Operating Characteristics and User Interface	SAE J2300	Minimum safety and human factors requirements for front collision warning (FCW) operating characteristics and driver interfaces to ensure consistency across vehicles so that drivers can quickly understand and safely use an FCW equipped vehicle.
Guide for Microwave Communications System Development	IEEE 1404	A guide that addresses all the requirements for microwave system design, procurement, construction, maintenance, and subsequent operations.
ISP-Vehicle Location Referencing Message	SAE J1746	A referencing format for ISP-to vehicle and vehicle-to-ISP references. Will reflect the cross-streets profile of the current location reference message specification (LRMS) document as expressed in the National Location Referencing Information Report (SAE J2374).
ITS Data Bus Architecture Reference Model Information Report	SAE J2355	A reference model for an in-vehicle data bus. The ITS data bus (IDB) will enable manufacturers, dealers, and vehicle owners to install a wide range of electronic equipment reliably and safely in a vehicle at any time during the vehicle's life cycle.
ITS Data Bus Conformance Test Procedure	SAE J2368	Testing procedures for physical and data link layers required to certify a device as IDB compliant. Ensures

		that devices support a fixed set of minimal messages. Primary categories of compliance testing are mechanical, electrical, and behavioral (plug and play).
ITS Data Bus Data Security Services Recommended Practice	SAE J1760	Specification of data security requirements between devices on the IDB and definitions of device- and message-level security. Also includes a mechanism to discourage theft of data bus modules.
ITS Data Bus Gateway Recommended Practice	SAE J2367	Requirements for the interface between the ITS systems on the IDB and the vehicle, specifically, what vehicle information will be made available to the IDB.
ITS Data Bus Protocol— Application Layer Recommended Practice	SAE J2366-7	Requirements for the application layer of the Open Systems Interconnection (OSI) model for the IDB.
ITS Data Bus Protocol— Link Layer Recommended Practice	SAE J2366-2	Requirements for the link layer of the OSI model for the IDB.
ITS Data Bus Protocol— Physical Layer Recommended Practice	SAE J2366-1	A physical interface device (connector) that will ensure compatibility between vehicles and after-market devices. Includes physical interface performance requirements, circuit identification and configuration, and electrical requirements for the physical layer of the IDB.
ITS Data Bus Protocol— Thin Transport Layer Recommended Practice	SAE J2366-4	Requirements for the thin transport layer (Layer 4 of the OSI model) for the IDB.
ITS Data Dictionaries Guidelines	IEEE ITSPP#6A	Key enabling guides and standards for the coordinated development of specialized ITS data dictionaries.
ITS In-Vehicle Message Priority	SAE J2395	Specification of orderly temporal and spatial presentation of ITS information to the driver.
In-Vehicle Navigation System Communication Device Message Set Information Report	SAE J2256	Definition of the form and content of the messages sent between a traffic management center (TMC) or ISP and vehicles, including traffic information, emergency service, and route guidance information.
Information Report on ITS Terms and Definitions	SAE J1761	A dictionary of terminology in the ITS field, with a focus on the vehicle and interfaces to the vehicle.
Mayday Industry Survey Information Report	SAE J2352	A summary of information obtained from a survey conducted in 1997 of Mayday system manufacturers. The information is limited to technical data as it pertains to vehicle and on-board Mayday system operations. The survey's purpose was to determine whether the general concept and architecture on which the J22313 Mayday Message Set was based are consistent with those of current Mayday system hardware manufacturers.
Measurement of Driver Visual Behavior Using Video Based Methods (Def. & Meas.)	SAE J2396	Procedures for collecting, reducing, analyzing, and reporting on driver eye-glance data in a manner suitable for evaluating ITS systems and comparing alternative designs

		for a particular system in terms of visual demand. Helps ensure that systems minimize the time a driver's eyes are off the road.
Message Set for External TMC Communication (MS/ETMCC)	ITE TM 2.01	A message set standard for communication between TMCs and other ITS centers, including ISPs, emergency management systems, mission management systems, and transit management systems.
Message Sets for DSRC ETTM & CVO	IEEE 1455	Standard messages for commercial vehicle, electronic toll, and traffic management applications.
NTCIP—Application Profile for File Transfer Protocol (FTP)	AASHTO 2303	A common application profile providing connection-oriented file transfer services. (Formerly TS 3.AP-FTP-100x.)
NTCIP—Application Profile for Simple Transportation Management Framework (STMF)	AASHTO 2301	A set of application, presentation, and session layer protocols to provide simple information management services. (Formerly TS 3.AP-STMF.)
NTCIP—Application Profile for Trivial File Transfer Protocol	AASHTO 2302	Definition of how to use the Trivial File Transfer Protocol within transportation networks. A common application profile providing connectionless file transfer services. (Formerly TS 3.AP-TFTP-199x.)
NTCIP—Application Profile for Common Object Request Broker Architecture (CORBA)	AASHTO 2305	Real-time peer-to-peer exchange (including some remote control/command capability) between TMCs and systems such as traffic operations centers, transit operations centers, emergency management centers, and traveler information systems. (Formerly TS 3.AP-CORBA.)
NTCIP—Applications Profile for Data Exchange ASN.1 (DATEX)	AASHTO 2304	Fulfills the need for a communications stack that supports routing, sequencing, and file transfer over point-to-point links, based on (sockets) TCP, IP, and PPP. (Formerly TS 3.AP-DATEX.)
NTCIP—Base Standard: Octet Encoding Rules (OER)	AASHTO 1102	A set of encoding/decoding rules for preparing data for transmission or decoding data before sending it to the application. Developed as a derivative of the Basic Encoding Rules (BER), as defined in ISO 8825-1. Within the NTCIP suites of protocols, OER is to be used in conjunction with NTCIP-STMF and NTCIP-DATEX ASN. (Formerly TS 3.BP-OER-1999.)
NTCIP—Class B Profile	AASHTO 2001	A general method of interconnecting ITS field equipment, such as traffic controllers and variable message signs. Includes the protocol and procedures for establishing communications between those components and the reference common data sets to be used by all such equipment. (Formerly TS 3.3.)
NTCIP—Data Collection and Monitoring Devices	AASHTO 1206	Specifies object definitions that may be supported by data collection and monitoring devices, such as

		roadway loop detectors. (Formerly TS 3.DCM.)
NTCIP—Data Dictionary for Closed Circuit Television (CCTV)	AASHTO 1205	A database for closed circuit television systems. The format of the database is identical to that of other NTCIP devices and uses ASN.1 representation. Targeted devices include cameras, lenses, video switches, and positioning controls for aiming identification, such as videotext overlays. The standard will support various levels of conformance. (Formerly TS 3.CCTV.)
NTCIP—Global Object Definition	AASHTO 1201	Definition of those pieces of data likely to be used in multiple device types, such as actuated signal controllers and dynamic message signs. Examples of these data include time, report generation, and scheduling concepts. (Formerly TS 3.4.)
NTCIP—Internet (TCP/IP and UDP/IP) Transport Profile	AASHTO 2202	A set of transport and network layer protocols to provide connectionless and connection-oriented transport services. (Formerly TS 3.TP-INTERNET.)
NTCIP—Object Definitions for Actuated Traffic Signal Controller Units	AASHTO 1203	Specifications for objects that are specific to actual signal controllers and definitions of standardized object groups that can be used for conformance statements. (Formerly TS 3.5.)
NTCIP—Object Definitions for Dynamic Message Signs	AASHTO 1203	Definition of data specific to dynamic message signs, including all types of signs that can change state, such as blank-out signs, changeable signs, and variable signs. (Formerly TS 3.6.)
NTCIP—Object Definitions for Environmental Sensor Stations & Roadside Weather Information System	AASHTO 1204	Definitions of objects that are specific to environmental sensor stations (ESSs) and object groups that can be used for conformance statements. Communication between remote entities and ESSs is accomplished by using the NTCIP application layer services to convey requests to access or modify values of ESS objects. (Formerly TS 3.7.)
NTCIP—Object Definitions for Video Switches	AASHTO 1208	Definition of the data needed to control a video switch enabling multiple monitors to view multiple video feeds.
NTCIP—Point to Multi-Point Protocol Using RS-232 Subnetwork Profile	AASHTO 2101	A set of data link and physical layer protocols applicable to roadside devices. (Formerly TS 3.SP-PMPP232-1998.)
NTCIP—Profiles—Framework and Classification of Profiles	AASHTO 8003	A framework and classification scheme for developing combinations and/or sets of protocols related to communication in an ITS environment. (Formerly TS 3.PRO.)
NTCIP—Ramp Meter Controller Objects	AASHTO 1207	Specifications for objects that are specific to ramp metering controller operations. (Formerly TS 3.RMC.)
NTCIP—Simple Transportation Management Protocol (STMP)	AASHTO 1101	A set of rules and protocols for organizing, describing, and exchanging transportation management information between

		transportation management applications and transportation equipment such that they interoperate with each other. (Formerly TS 3.2.)
NTCIP—Simple Transportation Management Protocol (STMP)	AASHTO 1103	A set of rules and procedures for exchanging information with a minimum of overhead to provide an interoperability standard for transportation-related devices that operate over bandwidth-limited communication links. (Currently part of TS 3.2.)
NTCIP—Subnet Profile for Point-to-Point Protocol Using RS 232	AASHTO 2103	A subnetwork profile that defines requirements for the data link and physical layers of a communications stack. Specifies the rules and procedures for using the point-to-point protocol over RS-232 related circuits. The intent is to provide an interoperability standard for transportation-related devices that communicate over dial-up circuits. (Formerly TS 3.SP-PPP/RS232.)
NTCIP—Subnetwork Profile for Ethernet	AASHTO 2104	A subnetwork profile that defines requirements for the data link and physical layers of a communications stack. Specifies the rules and procedures for using the Institute of Electrical and Electronics Engineers (IEEE) Link Layer Control (802.2) and Media Access Control (802.3) protocols over coaxial, twisted pair, or fiber-optic media. The intent is to provide an interoperability standard for transportation-related devices that communicate over local area network (LAN) interfaces. (Formerly TS 3.SP-Ethernet.)
NTCIP—Transportation System Sensor Objects	AASHTO 1209	Object definitions that are specific to and guide the data exchange content between advanced sensors and other devices in an NTCIP network. Advanced sensors include video-based detection sensors, inductive loop detectors, sonic detectors, infrared detectors, and microwave/radar detectors. (Formerly TS 3.EP-TSS.)
National Location Referencing Information Report	SAE J2374	A basis for location referencing standardization activities by various application communities and SDOs.
On-Board Land Vehicle Mayday Reporting Interface	SAE J2313	A general specification prescribing protocol methods that enable vendors with different communication methods to communicate with response agencies in a standard format.
Recommended Practice for the Selection and Installation of Fiber Optic Cable	IEEE P1454	Guidelines for the installation, splicing, and connection of fiber-optic cable, and testing for urban, suburban, and rural communication requirements, as well as for transportation operations centers.
Serial Data Comm. Between	SAE J1708	A recommended practice for implementing

MicroComputer Systems in Heavy-Duty Vehicle Applications		a bidirectional, serial communications link among modules containing microcomputers. Defines those parameters of the serial link that relate primarily to hardware and basic software compatibility, such as interface requirements, system protocol, and message format.
Stakeholder's Workshop Information Report	SAE J2373	Results of workshops held to solicit and discuss stakeholder requirements for location referencing standardization.
Standard Specification for DSRC—Data Link Layer	ASTM Draft Z7633Z	Specification for the protocol (data link) communications. Supports both synchronous and asynchronous modes of operation.
Standard Specification for DSRC—Physical Layer 902–928 MHz	ASTM PS 111-98	Specification for the radio frequency (RF) characteristics (physical layer) for DSRC operating in the range of 902 to 928 MHz. Supports both active and backscatter transponders.
Standard for ATIS Message Sets Delivered Over Bandwidth Restricted Media	SAE J2369	A general framework allowing transmission of traveler information via bandwidth reduced media, such as those found in wireless applications. Creates a uniform coding and message structure for link travel times, incident text, weather, and transit for broadcast delivery.
Standard for Common Incident Management Message Sets (IMMS) for use by EMCs	IEEE P1512	Standards describing the form and content of the incident management message sets from emergency management systems (EMSs) to traffic management systems (TMSs) and from EMSs to the emergency telephone system (ETS) or E911.
Standard for Data Dictionaries for Intelligent Transportation Systems	IEEE 1489	A set of meta-entities and meta-attributes for ITS data dictionaries, as well as associated conventions and schemas, that enable describing, standardizing, and managing all ITS data.
Standard for Functional Level Traffic Management Data Dictionary (TMDD)	ITE TM 1.03	Data elements for roadway links and for incidents and traffic-disruptive roadway events. Includes data elements for traffic control, ramp metering, traffic modeling, video camera traffic control, parking management, and weather forecasting, as well as data elements related to detectors, actuated signal controllers, vehicle probes, and dynamic message signs.
Standard for Message Set Template for ITS	IEEE P1488	A standard for an ITS message set template.
Standard for Navigation and Route Guidance Function Accessibility While Driving	SAE J2364	Guidelines to help ensure ease of learning and ease of use in navigation and route guidance systems and to minimize the visual and cognitive demands associated with the use of these systems.
Subcarrier Traffic Information Channel (STIC) System	EIA-795	A flexible waveform defined for the physical and data link layers for delivery of data to mobile and fixed users using a subcarrier on a

		broadcast FM station. Supports ATIS message sets (SAE J2369); differential Global Positioning System (GPS) message sets defined by Radio Technical Commission for Maritime Services Special Committee No. 104; emergency alert system messages defined by the Code of Federal Regulations (CFR) Title 47, Part 11; and retransmission of Radio Broadcast Data System data.
Survey of Communications Technologies	IEEE ITSP#5	Survey and analysis of existing standards (and those under development) that include requirements for both wireline and wireless transmissions. The full title of this standard is "Survey and Analysis of Existing Standards and Those Under Development Applicable to the Needs of the Intelligent Transportation System (ITS) Short-Range and Wide-Area Wireless Communications."
TCIP—Common Public Transportation (CPT) Business Area Standard	ITE 1401	Data objects for standard data types, data elements, and messages shared by and common to other transit business areas. Includes general data concepts related to vehicle, equipment, and facility.
TCIP—Control Center (CC) Business Area Standard	ITE 1407	Data objects for transit management center functions related to providing, monitoring, and measuring real-time transit revenue service.
TCIP—Fare Collection (FC) Business Area Standard	ITE 1408	Data objects related to passenger fare collection, including cash, electronic, and nonelectronic payment. Also provides output data to the fare media, processing of financial transactions, equipment status, and planning. (Formerly TS 3.TCIP-FC.)
TCIP—Framework Document	ITE 1400	Framework document for business area object standards for transit ITS. (Formerly TS 3.TCIP-FW.)
TCIP—Incident Management (IM) Business Area Standard	ITE 1402	Data objects for detecting, verifying, prioritizing, responding to, and clearing unplanned events (accidents, weather conditions, crime, etc.), as well as information for travelers. (Formerly TS 3.TCIP-IM.)
TCIP—Onboard (OB) Business Area Standard	ITE 1406	Data elements for onboard transit vehicle applications. Includes all data for communications between onboard components within the vehicle and other transit applications.
TCIP—Passenger Information (PI) Business Area Standard	ITE 1403	Data objects relating to providing passengers (and potential passengers) with information for planning and making public transportation trips. Includes schedules, fares, on-line services, trip planning
TCIP—Scheduling/Runcutting (SCH) Business Area Standard	ITE 1404	Data objects related to scheduling and runcutting. Includes requirements for master schedules, trip sheets, run guides, inventory files, etc., as well as output data for garage management, roadside

		devices, performance history. etc. (Formerly TS 3.TCIP-SCH.)
TCIP—Spatial Representation (SP) Business Area Standard	ITE 1405	Data objects for spatial representations to support other TCIP object sets. Allows for the transfer of location of transit objects and includes primitive elements and complex objects.
TCIP—Traffic Management (TM) Business Area Standard	ITE TS 3.TM	Data objects relating to traffic conditions, including planned changes in roadways and real-time traffic movement. Based on the ITE Traffic Management Data Dictionary and uses its data elements for data flowing into the transit agency.
Truth-in-Labeling Standard for Navigation Map Databases	SAE J1663	Definition of consistent terminology, metrics, and tests for describing the content and quality of navigable map databases. (Does not specify the physical format of the database or minimum performance standards.) The focus of this document is on supporting the navigation applications that automotive manufacturers and suppliers are currently developing for marketplace delivery.